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Effect of Aromatherapy on Sleep Quality: A Systematic Review

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Abstract

Background: Sleep disorders, commonly known as insomnia, are a risk factor that often occurs in chronic diseases, diabetes mellitus, hypertension, cardiovascular and obesity. The prevalence results of sleep disorders from countries worldwide ranged from 1.6% to 56.0%. The purpose of this systematic review is to analyze the effect of aromatherapy on sleep quality. **Methods:** a systematic review was applied in this study. Five databases are used: PubMed, Science Direct, Scholar, SAGE, and ProQuest. The article search starts in August – October 2022. **Results:** From 15 journals consisted of 12 randomized controlled trials (RCT) journals and three quasi-experimental journals. All studies are published in English, and the year of publication is 2017 – 2022. The methods used in providing the intervention are inhalation aromatherapy (10 articles), aromatherapy massage (4 articles), and a combination of both inhalation-massage (1 article). Aromatherapy is used, among others, lavender, peppermint, rosa damascene, tea tree oil, chamomile, and orange. **Conclusion:** Statistically, the effect of essential aromatherapy on sleep quality was significant. The effect of aromatherapy has an impact on improving sleep quality in adults, the elderly, and those with particular problems such as cancer, heart disease, hemodialysis, burns, ICU patients, and prediabetics. **Recommendation**: For future research, it is recommended to focus more on comparing the effectiveness of using aromatherapy between massage and inhalation in dealing with sleep quality.

Keywords: Sleep Quality, Insomnia, Aromatherapy, Essential oils

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INTRODUCTION

Sleep is one of the basic human needs (1). Sleep is a necessary process that provides rest, stability, and maintenance of health, both physically and mentally (2). Sleep disturbances in the long term can cause fatigue, daytime sleepiness, depression, anxiety, sensitivity, decreased immune system, mental function, and general health problems. (3). Sleep disorders commonly known as insomnia are a risk factor that often occurs in chronic diseases, diabetes mellitus, hypertension, cardiovascular and obesity (4). The results of the prevalence of sleep disorders from countries around the world ranged from 1.6% to 56.0% (5). While sleep disorders occur in about 10% - 15% of the adult population. Treatments for sleep disorders include pharmacotherapy, psychotherapeutic approaches, and complementary medicine such as aromatherapy (6).

National Asociation for Holistic Aromatherapy (NAHA) defines aromatherapy as "the art" and "science" of utilizing naturally derived aromatic essence extracts from plants with the aim of balancing, harmonizing, and supporting a healthy body, mind, and spirit (7). Aromatherapy effectively reduces stress and improves sleep quality in adults (8). Several aromatherapy essential oils can be used: lemon, eucalyptus, lavender, chamomile, and rose (1). The method of giving aromatherapy is inhaling, massaging, and bathing in essential oils (9). Aromatherapy is considered more effective in treatment because it takes a short time, is easy to use, and does not require special equipment (10).

A study by Ayik & Özden 2018 (11) stated that aromatherapy massage using lavender can improve sleep quality in colorectal surgery patients. It was also found that using aromatherapy utilizing steam inhalation in women who experience sleep disorders during the menopause period is efficacious in improving sleep quality (12). In cancer patients whose sleep quality was disturbed when given the rose aromatherapy intervention, there was no statistically significant increase ($p = 0.224$) in sleep quality. The average sleep duration before and after the intervention showed effective results ($p = 0.007$) (13).

Pharmacological therapy is more popularly used in overcoming sleep problems. Sleeping drug therapy is considered more effective than non-pharmacological therapy. However, if sleeping pills are used continuously, it will cause dependence and losses, including price, side effects, and tolerance to sleeping pills. In contrast, non-pharmacological treatment of sleep quality disorders is urgently needed to minimize the effects of pharmacological therapy because it does not give side effects and dependence. There are several non-pharmacological applications for overcoming sleep quality problems, namely sleep management therapy, psychological therapy, and relaxation therapy. Relaxation therapy can be done with deep breathing techniques, progressive muscle relaxation, self-surrender exercises, music therapy, and aromatherapy(14).

Many researchers have discovered the positive effects of aromatherapy, using methods, namely inhalation and massage, and several aromatherapy types. This is the background for compiling a systematic review that aims to determine the effect of aromatherapy on sleep quality. The research method used in compiling a systematic review is a quantitative study with meta-analysis.

Methods and Design

We conducted a review using a systematic review method of the use of aromatherapy in sleep disorders, especially in adults and the elderly. This systematic review begins by looking at the need for intervention for patients with sleep disorders, after which the topic of intervention that can be used to treat sleep disorders is determined. The article search study was conducted using an electronic database of keywords and criteria. Five databases are used: PubMed, Science Direct, Scholar, SAGE, and ProQuest. The search for articles started in August – October 2022. The keywords used were Sleep Quality, Insomnia, Aromatherapy, and Essential oils, using the phrases "AND" and "OR".

In this systematic review using PICO, which includes P =, the population is adults and the elderly who have sleep disorders. I = Giving aromatherapy to patients with sleep disorders by

massage or inhalation. C = given standard care without other interventions (music, placebo, and exercise). O = improve sleep quality. The inclusion criteria used are full-text articles in English published in 2015 – 2022. The articles taken are articles that use assessment of the Pittsburgh Sleep Quality Index (PSQI), Daytime Sleepiness Level—VAS (Visual Analog Scale), and Richards-Campbell Sleep Questionnaire (RCSQ). Exclusion criteria were studies that did not measure sleep quality or satisfaction as outcome variables.

In the next stage, the data collected from the database will be stored in Mendeley, and then the researcher will study the articles one by one, starting from the abstract and full text. After that, the data is submitted to the PRISMA checklist. We will discuss the gaps in the article. The study assessment process begins with the use of CASP tools (Critical Appraisal Skills Program). Ten questions are used to assist authors in thinking about problems systematically (15). CASP is an evaluation tool used to measure research quality and utility. Three things must be considered when assessing a systematic review: are the study results valid? What are the consequences? Will the results be helpful locally? There are several answer choices, namely "Yes," "Can't tell," and "No," and there are several questions that require a review answer. If an article gets more than 7 points, it is considered good and should be discussed systematically based on the topic.

Thirty-five articles from the PICO screening were assessed based on the CASP tools. CASP results, namely there were nine irrelevant articles included, seven articles the results did not describe the results of the review as a whole, 15 articles could not be applied to residents, 12 articles did not clearly explain whether the benefits were worth the losses and costs. The articles are good and deserve to be discussed systematically, namely 15 articles, because they get more than 7 CASP points, while the remaining 20 articles have points below them.

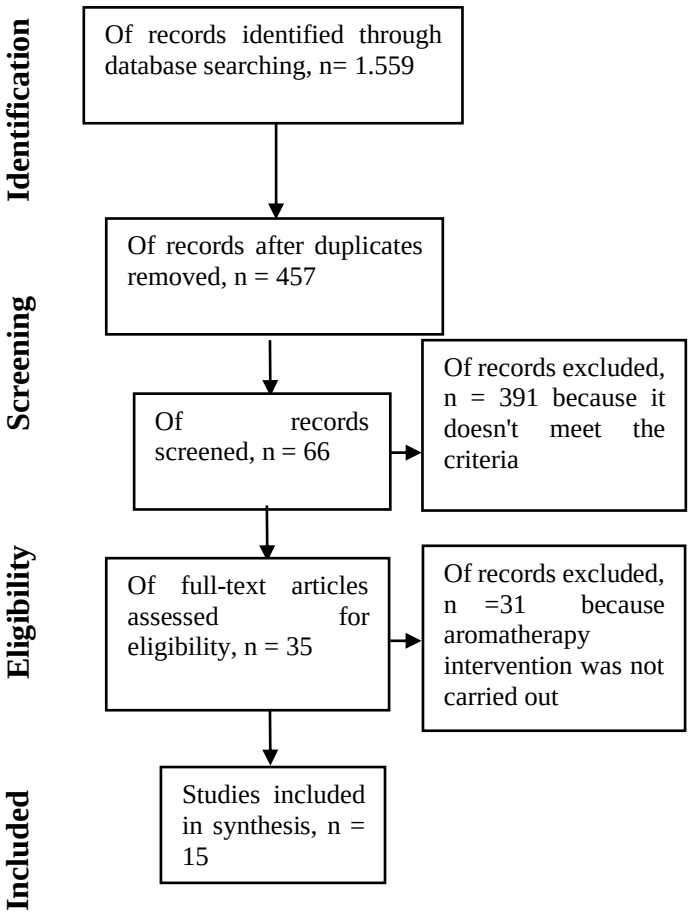

Figure 1. Articles Identification Flow Chart

RESULTS

Study Characteristics

Of the 15 journals consisting of 12 Randomized Controlled Trials (3,11,13,16-23). Journals and three quasi-experimental journals (12,24,25). Articles come from several countries, such as seven studies in Turkey, five studies from Iran, 2 in Korea, and 1 in Japan. All studies are published in English, and the year of publication is 2017 – 2022. The methods used in providing the intervention are inhalation aromatherapy (10 articles), aromatherapy massage (4 articles), and a combination of both inhalation-massage (1 article). Aromatherapy is used, among others, lavender, peppermint, rosa damascene, tea tree oil, chamomile, and orange.

Finding

Population

Based on Table 1 about the characteristics of the included studies. Of the 15 articles

analyzed, several populations were of different types. They had the same thing, namely sleep quality disturbances. 2 population journals are cancer patients (16,18), 2 journals are cardiac patients (17-18), 1 journal is chemotherapy patients (26), 1 journal is elderly patients (3), 1 journal is menopausal women (12), 1 journal is burn patients (24), 2 journals are palliative care patients (19-20), 1 journal is hemodialysis patients (22), 2 journals are patients treated in intensive care units (23,25), 1 journal is colorectal surgery patients (11), 1 journal are Prediabetic middle-aged women (21).

Design

There are 2 types of designs used in this systematic, namely Randomized Controlled Trials and quasi-experimental. The RCT design was used in 12 journals (3,11,13,16-23,26) and quasi-experimental in 3 journals (12, 24-25).

Type of Intervention

There are two types of intervention used, namely inhalation and massage. Most of the intervention methods use inhalation in administering aromatherapy; namely, there are 10 articles (3,12,13,16,17,19,21,22,23,26), while for intervention by massage, there are 5 articles (11,18,20,24,25). Lavender aroma is the most widely used essential oil in therapy, namely 10 journals (3,12,13,19,22,24,23,25), 1 journal uses Rosa damascene (17), 1 journal uses a mixture of sweet almond oil and lavender oil (18), 1 journal uses a combination of lavender oil and peppermint aromatherapy (16), 1 journal uses a mixture of lavender and tea tree oil (11), 1 journal uses a mix of lavender and orange (20).

Duration of Intervention

Intervention time varied from 1 – 30 days, consisting of 2 articles that intervened for 1 day (20,25), (25), 3 articles that intervened for 2 days (19), (23), (11), 1 article that intervened for 3 days (17), 4 articles for 7 days (16), (18), (22), (24), 2 articles for 14 days (13), (21), 1 article for 15 days (26), and 2 articles for 30 days (3), (12).

Effect of Intervention

The studies used to measure sleep quality are the Pittsburgh Sleep Quality Index (PSQI), Daytime Sleepiness Level—VAS (Visual Analog Scale), and the Richards-Campbell Sleep Questionnaire (RCSQ). Most studies used the Pittsburgh Sleep Quality Index (PSQI) to measure 13 articles. The average PSQI group intervention score was lower than the control group, including studies on the effects of aromatherapy using lavender and peppermint on cancer patients (16), then on the effects of aromatherapy massage on heart patients (18), the effects of aromatherapy on menopausal patients (12), and research on the impact of lavender oil aromatherapy on the anxiety and quality of burn patients (24).

Some results show differences in the significance level of giving aromatherapy to the population depending on the participants who are given the intervention. In accordance with research studies conducted by Hur M, Hong J, and Yeo S., aromatherapy is more effective in patients with stress, fluctuations, and fatigue (21) compared to cancer patients (13) and palliative care (19).

All articles show that aromatherapy contributes to improving sleep quality. However, one article states that there is no statistically significant difference between the two intervention groups, namely a mixture of sweet & lavender oil and sweet almond oil. There is a significant difference between the mean PSQI scores before and after the intervention in the intervention and control.

DISCUSSIONS

Difficulty sleeping will cause a person to have problems fulfilling daily activities and negatively impact sleep quality (14). The findings showed a relatively high heterogeneity with factors that influenced the study design, variations in the method of giving the intervention, concentrations of essential oils, the diversity of the population, the way to measure sleep quality, and a significant difference in the duration of the intervention from 1 day to 30 days.

The analysis shows that aromatherapy can improve sleep quality. Aromatherapy refers to the process in which the chemical components or molecules of essential oils stimulate the limbic system through the sense of smell after inhalation, activating the functions of the hypothalamus and pituitary gland. The olfactory nerves then send signals to the limbic system to

trigger memories and emotional responses, thereby relieving physical and mental stress (7). Regarding the method of giving aromatherapy, it was found that the mixed process tends to produce an effect compared to using only inhalation or massage (6).

The results show a positive effect of using aromatherapy on sleep quality in cancer patients (15). The most commonly used scent is lavender, which has a sedative and anxiolytic effect that can relax and induce sleep. After inhaling lavender aromatherapy, linalool and linalyl acetate will connect to the olfactory bulb receptors and exert a therapeutic influence on the limbic system. (27). In elderly patients, it was found that there was a difference in the average PSQI score of greater than five before aromatherapy was given, indicating poor overall sleep quality. After being given aromatherapy, the quality of sleep gets better (P <0,05) (1).

Research using rosa damascene aromatherapy in the experimental group showed a decreased Pittsburgh index score ($p < 0.05$). Sleep quality improved significantly compared to the control group, and sleep duration also became longer (13). Hypnotic and sedative effects are found in rosa damascene. Additionally, a recent review on the pharmacological effects of rosa damascene can prolong sleep by reducing physiological indicators, pain, and anxiety. The dose of Rosa Damascena aromatherapy has yet to be widely used, so further research must be done (28). Study conducted on hemodialysis patients, burns, postmenopausal women, cardiac, chemotherapy, palliative care, and patients treated in the ICU showed a positive effect of using aromatherapy on sleep quality. However, using aromatherapy routinely and continuously has a better impact than that done only one day. The application of aromatherapy not only affects sleep quality but can also suppress the stress response, especially the sympathetic nervous system's response. This systematic review has the advantage of showing the effect of essential aromatherapy not only on the elderly population who experience sleep quality disorders but also in groups with terminal diseases such as cancer and heart hemodialysis. The disadvantage is that the aromatherapy extract ingredients used in this article still need to be found locally.

CONCLUSIONS

Statistically, the effect of essential aromatherapy on sleep quality was significant. The effect of aromatherapy has an impact on improving sleep quality in adults, the elderly, and those with special problems such as cancer, heart disease, hemodialysis, burns, ICU patients, and prediabetics. An effective intervention method is a combination of inhalation and massage. The aromatherapy used regularly and continuously will better impact sleep quality. It is recommended to conduct further studies on the number of doses that can be given by inhalation in people with sleep disorders.

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Here is an example of a table

Table 1. Characteristics of the Including Studies

No	Title Author	Participant	Population & Country	Study Design	Experimental G intervention	Control G Intervention	Type Of intervention	Duration of Intervention	Result
1.	Effects of Aromatherapy with Lavender and Peppermint Essential Oils on the Sleep Quality of Cancer Patients: A Randomized Controlled Trial (16)	Cancer patients	Total= 120 E1= 40 E2 = 40 C = 40 Country Iran	Randomized controlled trial	E1= lavender Aromatherapy, E2= peppermint aromatherapy	Aromatic distilled water	Inhalation aromatherapy	7 Days	The mean PSQI scores were lower in the lavender and peppermint groups than in the control group. Aromatherapy can improve the sleep quality of cancer patients.
2.	Effect of rosa damascene aromatherapy on anxiety and sleep quality in cardiac patients: A randomized controlled trial (17)	Cardiac patients	Total = 60 E= 30 C = 30 Country Iran	Randomized controlled trial	Rosa damascene	Distilled water as a placebo	Inhalation aromatherapy	3 Days	The use of Rosa damascene aroma in patients hospitalized in the cardiac care unit significantly reduces anxiety and increases the improvement of sleep quality. The significance level for anxiety and sleep quality was (P = 0.001).
3.	Comparing the effects of massage and aromatherapy massage with lavender oil on sleep quality of cardiac patients: A randomized controlled trial (18)	Cardiac patients	Total= 150 E1= 50 E2 = 50 C = 50 Country Iran	Randomized controlled trial	E1= Mixture of sweet oil and lavender oil E2= sweet almond oil	No intervention and receiving routine care	Aromatherapy massage	7 Days	There was a significant difference between the mean scores of PSQI before and after the intervention in the intervention and control groups. Still, this difference was not statistically significant between the two intervention groups.
4.	The effect of lavender on anxiety and sleep quality in patients treated with chemotherapy (Ayse Özkaraman, Özlem	Chemotherapy Patients	Total = 70 E1= 30 E2 = 20 C = 20	Randomized controlled trial	E1=Lavender Oil, E2= Tea tree oil	No intervention	Inhalation aromatherapy	15 Days	There was a significant difference in measurements between the lavender and control

No	Title Author	Participant	Population & Country	Study Design	Experimental G intervention	Control G Intervention	Type Of intervention	Duration of Intervention	Result
	Dügüm, Hülya Özen Yılmaz, and Öznur Usta Yeşilbalkan, 2018)		Country Turkey						groups only at the second assessment.
5.	The Effect of Aromatherapy on Sleep Quality and Fatigue Level of the Elderly (3)	Elderly People	Total=59 E=30 C=29 Country Turkey	Randomized controlled trial	Lavender oil	No Intervention	Inhalation aromatherapy	30 Days	In the study, it was determined that aromatherapy administration improved sleep quality (P< .001)
6.	The Effect of Aromatherapy on Sleep and Quality of Life in Menopausal Women with Sleeping Problems: A Non-Randomized, Placebo-Controlled Trial (12)	Menopausal Women	Total=57 E=27 C=30 Country= Turkey	Quasi-experimental	Lavender oil	Placebo	Inhalation aromatherapy	30 days	For the intervention group, the PSQI median scores after the administration of aromatherapy were found to be significantly lower than those before the administration ($p < 0.001$) and those of the placebo group ($p < 0.001$)
7.	The effect of aromatherapy massage with lavender and chamomile oil on anxiety and sleep quality of patients with burns (24)	Patients with burn injuries	Total=100 E1=34 E2=33 C =33 Country Iran	Quasi-experimental	E1= Combined aromatic oil massage E2=Placebo massage	Daily routine care	Massage with lavender	Seven days	The results showed a significant difference among the three groups regarding sleep quality after the intervention (P=0.027).
8.	The Effect of Lavender Oil Application via Inhalation Pathway on Hemodialysis Patients' Anxiety Level and Sleep Quality (22)	Hemodialysis patients	Total=34 E=17 C=17 Country Turkey	Randomized controlled trial	Lavender oil	No Intervention	Inhalation aromatherapy	Seven days	The subjective sleep quality of the intervention group was higher than that of the control group, and the mean Visual Analog Scale daytime sleepiness score declined (P < .05), and the mean score of sleep duration increased (< .001)
9.	The Effect of Lavender Oil on Sleep Quality and Vital Signs in Palliative	Palliative Care	Total=68 E=34 C=34	Randomized Clinical Trial	Lavender Oil	No Intervention	Inhalation aromatherapy	Two day	It was observed in the evaluation that lavender application did not affect the vital signs of the

No	Title Author	Participant	Population & Country	Study Design	Experimental G intervention	Control G Intervention	Type Of intervention	Duration of Intervention	Result
	Care: A Randomized Clinical Trial (19)		Country Turkey						patients, but it ensured a more profound sleep on the 2nd day after the intervention, facilitated their falling asleep and sleeping again when they were awakened, and enhanced sleep quality ($p<0.05$).
10.	The Effects of Aromatherapy on Intensive Care Unit Patients' Stress and Sleep Quality: A Nonrandomised Controlled Trial (23)	Intensive Care Unit Patients	Total=60 E=30 C=30 Country Korea	Randomized Clinical Trial	Essensial oil lavender	No Intervention	Inhalation aromatherapy	2 Days	The experimental group and control group showed a significant difference in perceived sleep quality ($F = 109.46$, $P < .001$)
11.	The effects of preoperative aromatherapy massage on anxiety and sleep quality of colorectal surgery patients: A randomized controlled study (11)	Colorectal surgery patients	Total=80 E=40 C=40 Country Turkey	Randomized Clinical Trial	Lavender oil	Standard nursing care	Aromatherapy massage	2 Days	It was found that aromatherapy massage with lavender oil increased sleep quality and reduced anxiety in patients with colorectal surgery in the preoperative period.
12.	Effect of aromatherapy massage on quality of sleep in the palliative care ward: a randomized controlled trial (20)	palliative care	Total=57 E=27 C=30 Country Japan	Randomized Clinical Trial	Lavender and orange	No Intervention	Aromatherapy massage	1 Day	A single aromatherapy massage session is only as practical as not having a massage in improving sleep quality in palliative care settings.
13.	Efficacy of aromatherapy with Rosa damascena in the improvement of sleep quality of cancer patients: A randomized controlled clinical trial (13)	Cancer patients	Total=45 E1=15 E2=15 C=15 Country Iran	Randomized controlled clinical trial	E1=Lavender 5%, E2=Lavender 10%	No Intervention	Inhalation aromatherapy	14 Days	In patients who used essential oil (5% and 10%), the sleep quality significantly improved compared with the control group after the intervention ($P < 0.05$). The

No	Title Author	Participant	Population & Country	Study Design	Experimental G intervention	Control G Intervention	Type Of intervention	Duration of Intervention	Result
14.	Effects of aromatherapy on stress, fructosamine, fatigue, and sleep quality in prediabetic middle-aged women: A randomized controlled trial (21)	Prediabetic middle-aged women	Total=62 E=31 C=31 Country Korea	Randomized Clinical Trial	Aroma essential oil	No Intervention	Inhalation and massage	14 days	After the treatment, there were Significant changes in sleep quality (t=6.27, p<.001)
15.	Effects Of Aromatherapy Massage On The Sleep Quality And Physiological Parameters Of Patients In A Surgical Intensive Care Unit (25)	Patients In A Surgical Intensive Care Unit	Total=60 E=30 E=30 Country Turkey	Quasi-experimental	Lavender oil	No Intervention	Aromatherapy Massage	1 Day	Results of the study showed that aromatherapy massage enhanced the sleep quality of patients in a surgical intensive care unit and resulted in some positive changes in their physiological parameters.